Datasheet

MSO3000HD Series High-resolution Oscilloscope

V1.0

2024.08.07

Product Introduction

The MSO3000HD Series from UNI-T epitomizes the cutting-edge in high-resolution oscilloscopes. Engineered for affordable precision, this series boasts a maximum of 500 MHz bandwidth and 2.5 GSa/s sampling rate, with four analog and 16 digital channels, supported by a substantial 500 Mpts storage depth.

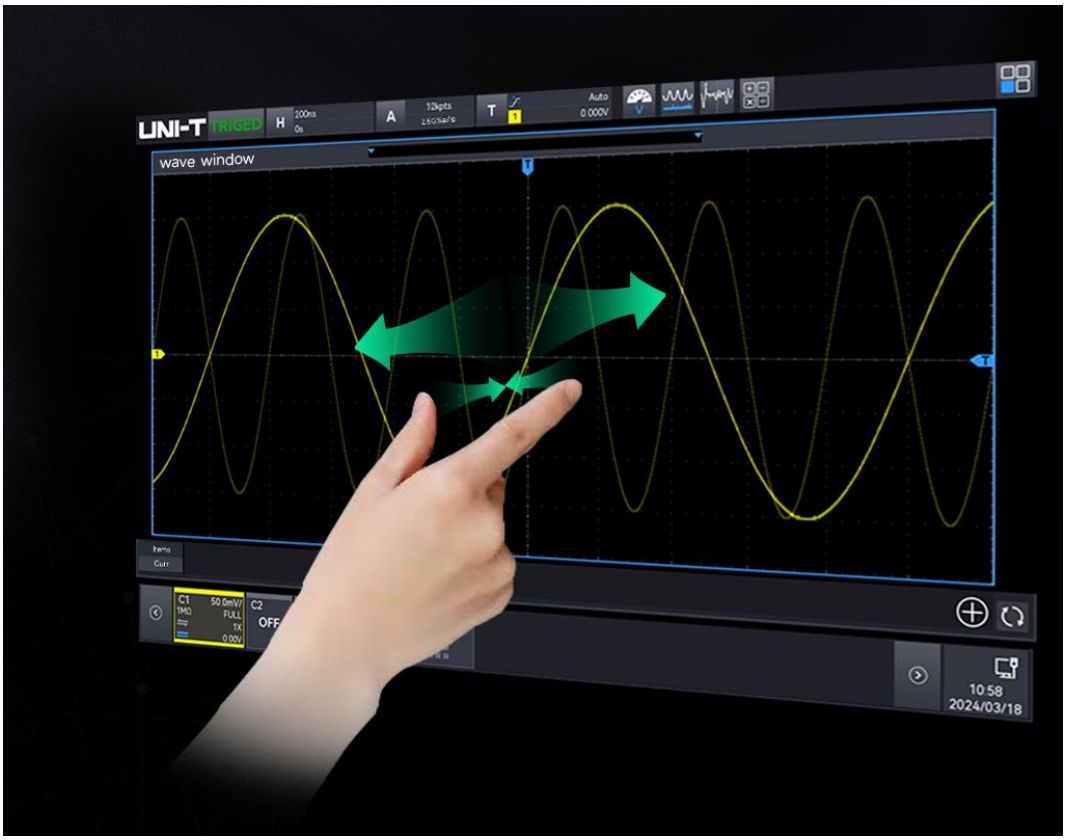
Incorporating Ultra Phosphor 3.0 technology, the MSO3000HD achieves up to 1,500,000 wfms/s capture rates, displayed in rich detail with 256 gray temperature colors. Enhanced by a high-sensitivity digital trigger system with minimal jitter, it sets the standard in signal accuracy.

Our MSO3000HD includes advanced triggers, serial bus analysis, and industry-leading sampling and analysis modes such as spectrum and power analysis, hardware-accelerated template testing, and easy-to-use search and navigation. To make your testing easier, you will also find a multitude of measurement and mathematical operations. This series also features a 10.1-inch capacitive touchscreen, boosting operational efficiency with intuitive gestures and one-touch keys. The MSO3000HD is more than a tool for measurement; it's your gateway to enhanced productivity, reflecting UNI-T's commitment to delivering high-quality, cost-effective solutions that meets both the needs and budgets of seasoned professionals across all industries.

Mainstream touchscreen design providing an intelligent interactive experience

Equipped with a 10.1-inch HD capacitive multi-touch screen, the MSO3000HD stands at the convergence of precision and intuitiveness, catering to the diverse operational needs of the savvy electrical engineer, the student-learner, and every tech enthusiast in between. This advanced interface supports a spectrum of gesture operations—including touch, drag, zoom, and rectangle drawing—streamlining your workflow, enhancing your interaction with the device, and simplifying the learning curve.

Yet, in our quest for cutting-edge innovation, we have not forsaken the tried-and-true. Our instruments maintain traditional key and knob controls, seamlessly integrating with mouse and keyboard support. This duality of operation doesn't just add versatility—it redefines it, elevating the interactive experience to new heights.



Brand new appearance design

MSO3000HD series features an innovative appearance with a thinner profile, taking up less space on your bench. The display is aligned horizontally with the panel to enhance touch operation and visibility range. The black frame margin, combined with the metal grey and black body, enhances the overall look of the instrument.

Features and Advantages

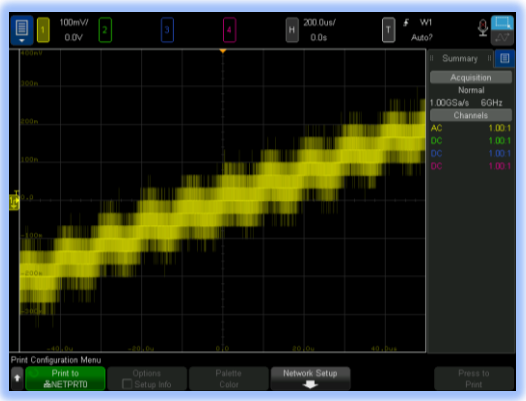
- Analog channel bandwidth: 500 MHz/350 MHz/200 MHz
- Real-time sampling rate of the analog channel is up to 2.5 GSa/s. The maximum sampling rate of the digital channel is 1.25 GSa/s
- 12-bit vertical resolution, with up to 4096 points, ensures that the waveform details are clearly visible
- 4 analog channels, 16 digital channels, and a maximum storage depth of 500 Mpts
- The maximum waveform capture rate is 500,000 wfms/s (sequence mode: 1,500,000 wfms/s)
- 9 instrument functions: Digital Oscilloscope, Logic Analyzer, Function/Arbitrary Waveform Generator, Spectrum Analyzer, Digital Voltmeter, Frequency Meter, Protocol Analyzer, Bode Plot Analyzer, and Power Analyzer
- Built-in 50 MHz dual-channel function/arbitrary waveform generator supporting the ability to load the oscilloscope on-screen data to generate an arbitrary waveform output in real time. Also features multiple built-in arbitrary waveforms
- Low background noise: 70 μVrms at the full bandwidth of 500 MHz
- Bode plot loop test analysis function designed to analyze the system stability
- Parameter measurement adds histogram and line graph display
- Uninterrupted hardware real-time waveform recording and analysis of up to 125,000 frames and supports USB memory export function
- Enhanced FFT of up to 4M points, supporting spectrum analyzer functions such as frequency setting, waterfall curve, detection setting, and marker
- Supports ERES (enhanced resolution) of up to 4-bit (16-bit ERES)
- 54 kinds of parameter measurements
- Multi-Windows display makes it easy to compare your channels the way you want, with drag-and-drop ease
- Multi-channel 7-digit hardware frequency meter, supporting frequency refresh time and adjustable effective digit settings
- DVM multi-channel RMS measurement: DC, AC RMS and DC+ACRMS
- Multiple trigger types: edge, pulse width, video, ramp, runt pulse, over-amplitude pulse, delay, timeout, duration, setup & hold, Nth edge and code pattern
- Protocol triggering and decoding function: RS232/UART, I^2C, SPI, CAN, CAN-FD, LIN, FlexRay, Audio, MIL-STD-1553B, Manchester, SENT, ARINC429

- Zone trigger for capturing and observing sporadic and complicated signals
- Ultra Phosphor 3.0 provides a super fluorescent display effect with up to 256 levels of gray
- 10.1-inch 1280x800 HD capacitive multi-touch screen, supporting gesture control such as click, slide, zoom, edit, and drag
- Multiple peripheral interfaces: USB Host, USB Device, LAN, EXT Trig, AUX Out (Trig Out, Pass/Fail, DVM), Gen Out, HDMI
- Supports SCPI (Standard Command for Programmable Instrument)
- Built-in WebServer for accessing and controlling the instrument through a browser, supporting access from PC and mobile devices for cross-platform compatibility.
- Supports on-line update

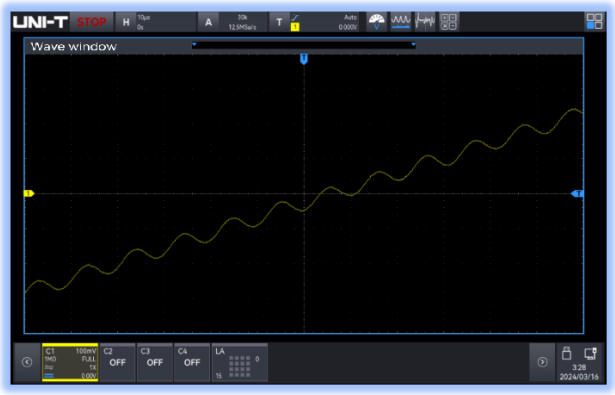
Design Features

High-resolution

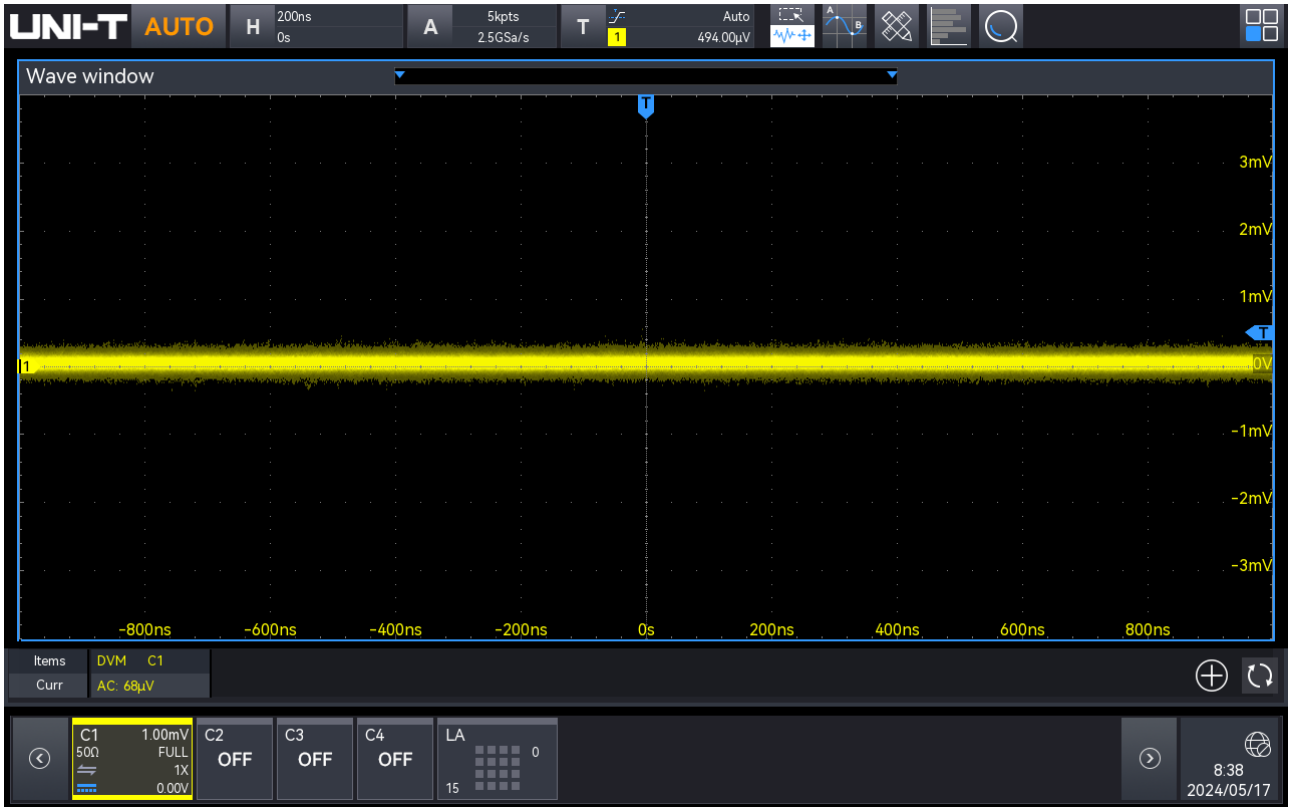
12-bit high-resolution ADC sampling has a quantization level of up to 4096, which is 16 times that of a traditional 8-bit ADC, allowing for better restoration of waveform details.



8-bit

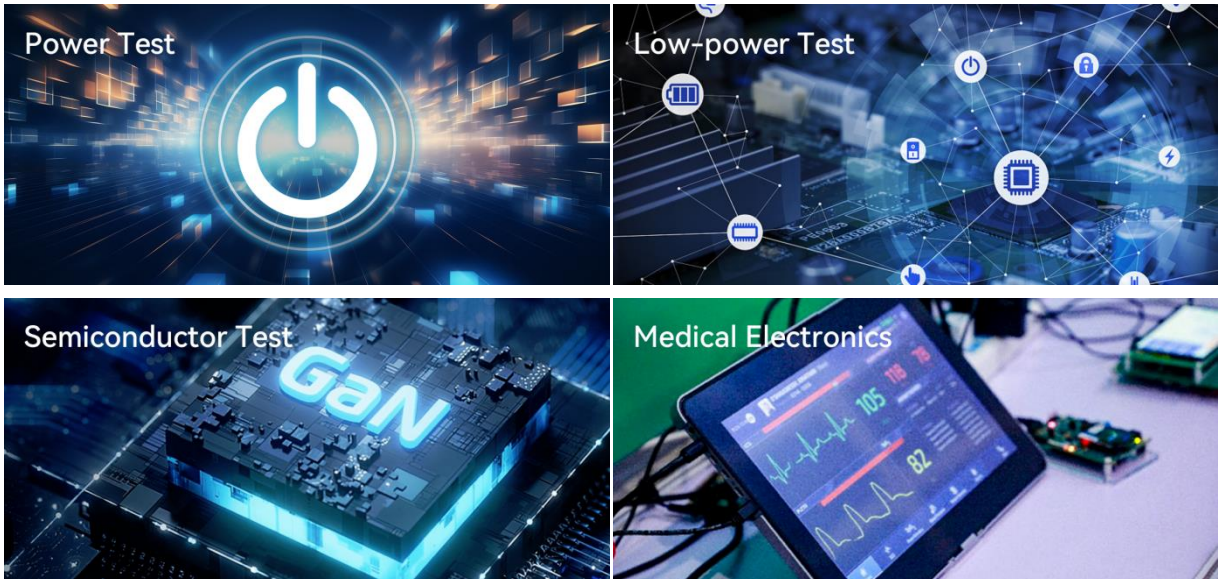


12-bit



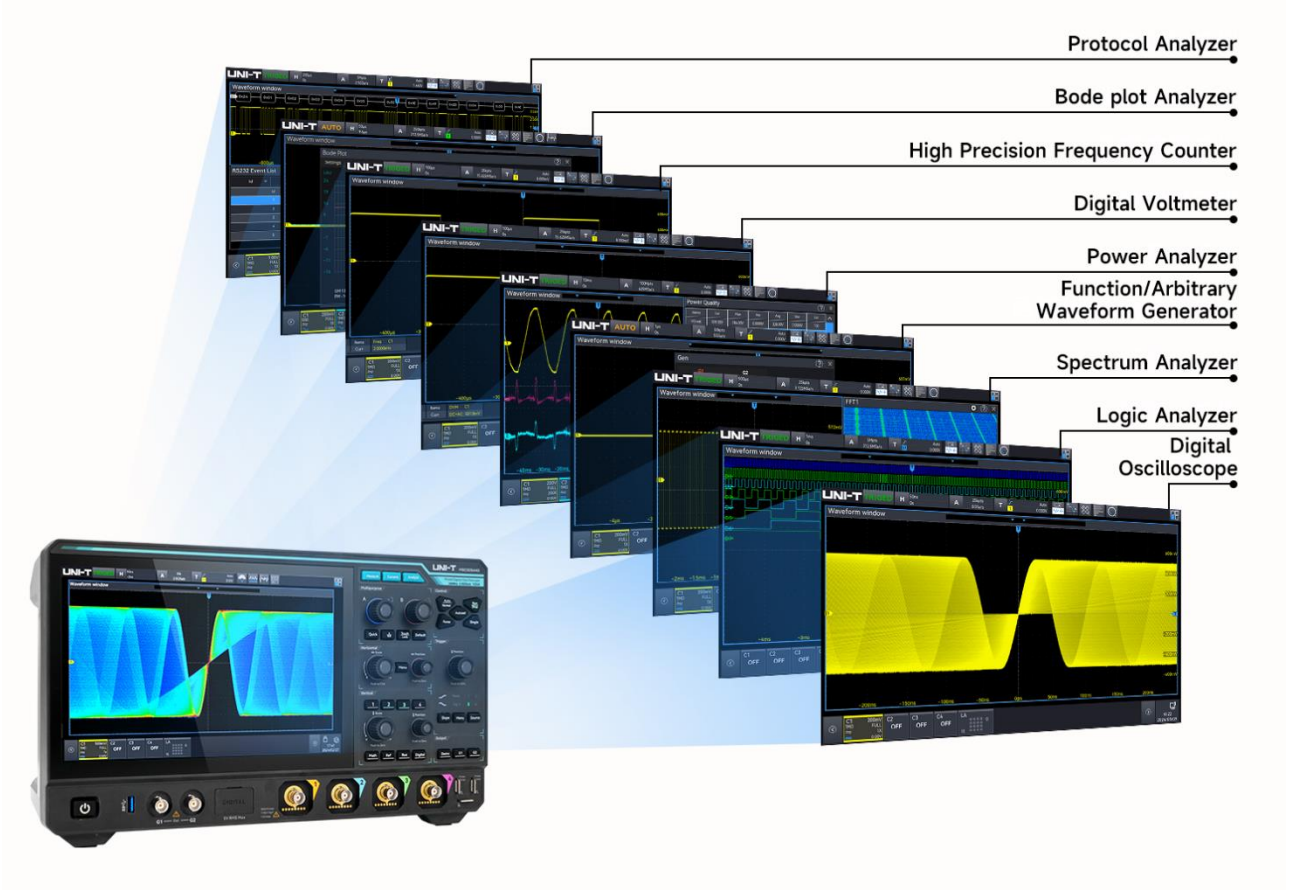
The excellent background noise, which is only 70 µVrms at the full bandwidth of 500 MHz, allows the 12-bit ADC to perform optimally.

Application Scope



Cost-effective, Nine-in-one Integrated Oscilloscope

MSO3000HD series integrates nine instrument functions, including a digital oscilloscope, logic analyzer, function/arbitrary waveform generator, spectrum analyzer, digital voltmeter, high-precision frequency meter, protocol analyzer, Bode plot analyzer, and power analyzer. This is a cost-effective oscilloscope for users.



Digital Oscilloscope

- Bandwidth: 500 MHz/350 MHz/200 MHz
- Maximum real-time sampling rate: 2.5 GSa/s
- Maximum storage depth: 500 Mpts
- 4 analog channels, 1 external trigger channel

Logic Analyzer (**Option**)

- 16-channel logic analyzer (hardware standard) can be used with the purchase of a UT-M15 logic analyzer probe (optional).
- Logic Analyzer Software is standard
- Maximum sampling rate: 1.25 GSa/s
- Maximum storage depth: 500 Mpts
- Minimum detectable pulse width: 800 ps

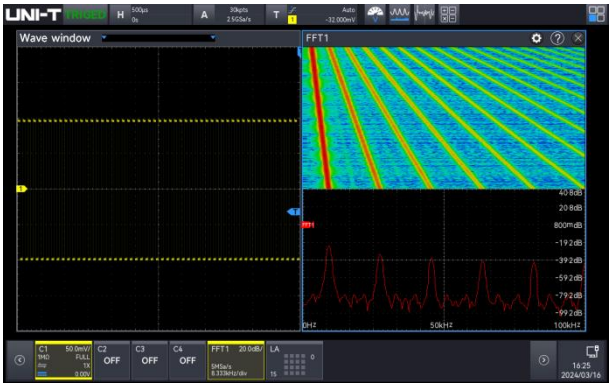
- Digital probe provides separate high 8-bit and low 8-bit connections, it simplifies the connection of DUT. When connecting to square pins, UT-M15 can be connected directly to 8x2 square pins (2.54 mm)
- Logic analyzer probe UT-M15 has great electrical characteristics, with the input impedance of 101 kΩ ± 1% and the capacitive load of only 9.0 pF

Function/Arbitrary Waveform Generator (Option)

- 50 MHz dual-channel output
- Sampling rate: 250 MSa/s
- Vertical resolution: 16-bit
- Multiple built-in standard waves: Sine, square, pulse, ramp, arbitrary, noise, and DC
- AM, FM, ASK, FSK, and sweep frequency output

Spectrum Analyzer

- Standard enhanced FFT with up to 4 Mpts for 4-channel signal analysis
- Frequency range: 0 to 2.5 GHz
- Waterfall curve
- 4 traces and 4 detections
- Mark type: Auto, manual and threshold
- Marker point list



Digital Voltmeter

- 4-digit voltmeter
- Measurement: DC/AC RMS/AC+DCRMS
- Limit alarm

High-precision Frequency Meter

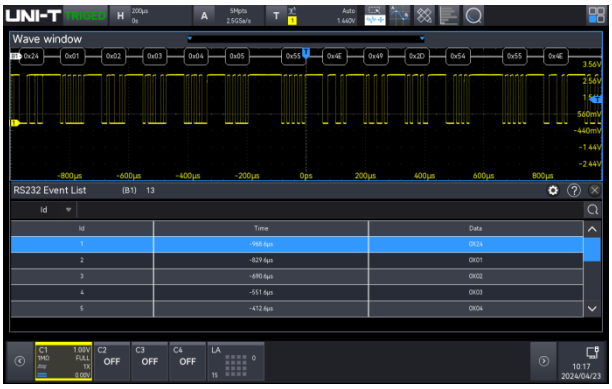
- 7-digit hardware frequency meter
- Frequency meter: Refresh time and adjustable
  effective digit settings
- Summary counter

Bode Plot Analyzer (Option)

- Included with function/arbitrary waveform generator option
- Frequency response analysis
- Loop stability analysis
- Filter analysis
- Amplifier analysis

Protocol Analyzer

- 12 kinds of triggering and decoding protocols, including those for computers, embedded serial buses, automobile, aerospace, and audio applications.
- Decoding can be operated in the pause and record modes.
- Supports event list and search function



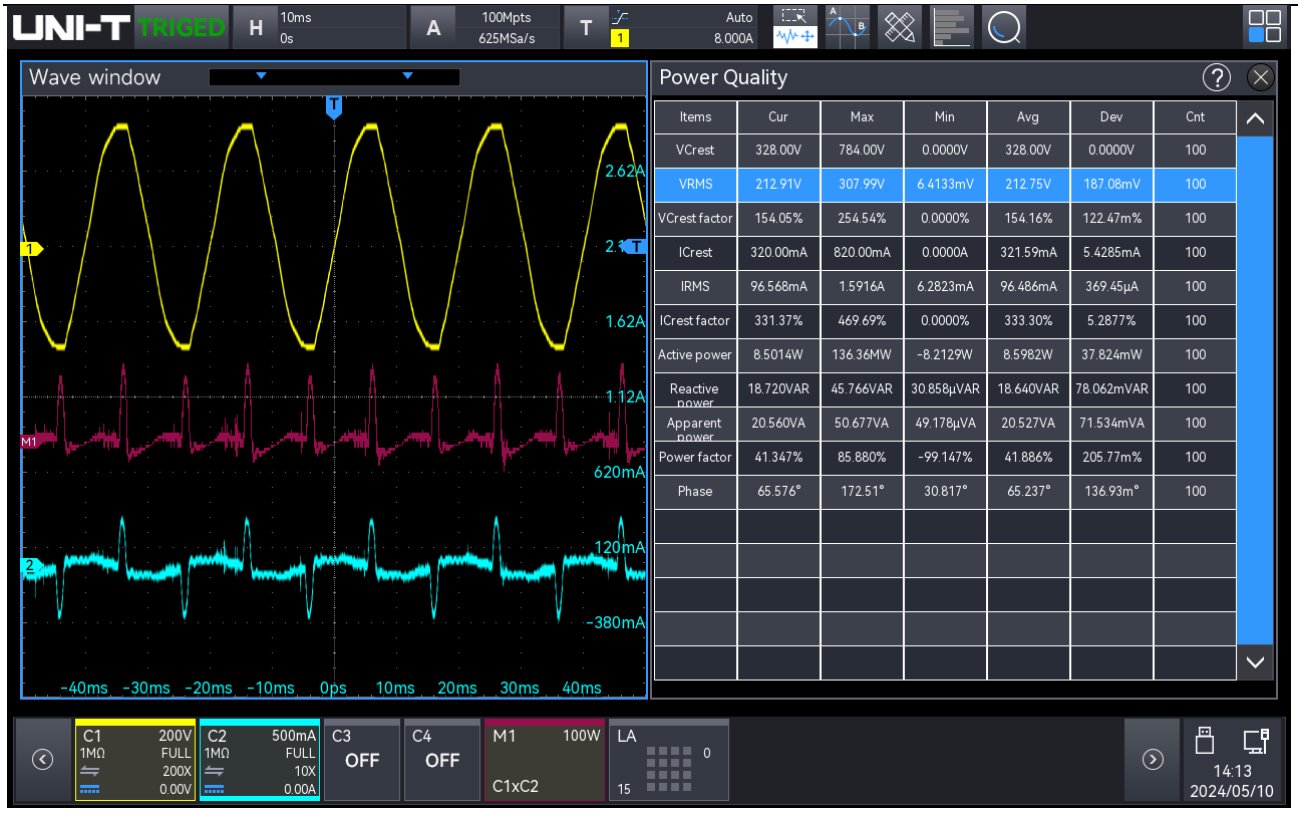
Option Name	Description	Option Model	Standard/Option
Computer serial bus triggering and analysis	RS-232/422/485/UART	-	Standard
Embedded serial bus triggering and analysis	I2C, SPI	-	Standard
Automobile serial bus triggering and analysis	CAN	MSO3000HD-CAN	Standard
Automobile serial bus triggering and analysis	LIN	MSO3000HD-LIN	Option
Automobile serial bus triggering and analysis	CAN-FD	MSO3000HD-CANFD	Option
Automobile sensor bus triggering and analysis	FlexRay	MSO3000HD-FLEX	Option
Computer serial bus triggering and analysis	SENT	MSO3000HD-SENT	Option
Audio serial bus triggering and analysis	Audio	MSO3000HD-AUDIO	Option
Aerospace serial bus triggering and analysis	MIL-STD-1553, ARINC 429	MSO3000HD-AREO	Option

Wireless communication trigger and analysis	Manchester	MSO3000HD-MANCH	Option

Power Analyzer (Option)

With the development of chip technology, the requirements for power supply systems are also increased. Nowadays, low-voltage, high-current power supply networks have become a trend. Especially for chips or networks composed of precision components, it is essential to ensure reliable power supply and noise suppression across various parts of the circuit, as well as to maintain the integrity of signal transmission between chips. This presents greater challenges for power supply testing. Designers are now more focused on energy-efficient power supplies and response speed to ensure the power supply remains stable and clean. Based on this, power integrity testing becomes particularly important. Power integrity directly affects signal integrity, and conversely, signal quality also reflects power quality. Furthermore, power quality can cause a series of electromagnetic interference issues, which can be a significant concern for designers. Therefore, having an oscilloscope capable of power analysis is undoubtedly your best choice. MSO3000HD series provides a comprehensive set of power analysis tools and evaluation results. To use them, simply select the appropriate analysis type and connect the voltage probe and current probe to the power system test point or specified test fixtures, as shown in the diagram. Then, connect to the desired channel for observation and make any necessary fine-tuning adjustments to achieve your desired results.

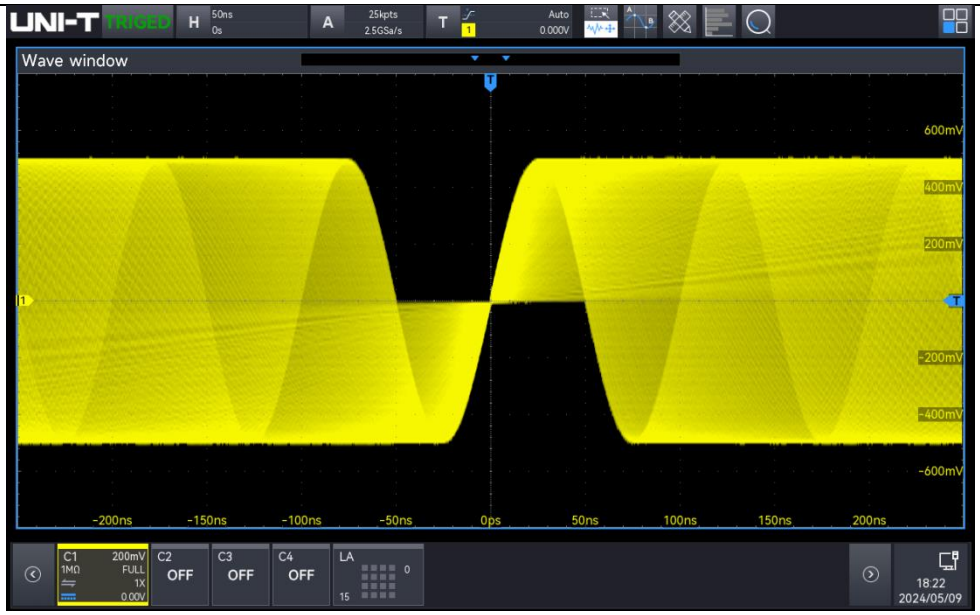
- Power quality
- Harmonic analysis
- Switching loss *
- Ripple wave analysis
- Loop analysis
- Safety operation area *



"*" indicates features being added. Power analysis support is subject to the latest firmware available on the official website.

Ultra Phosphor 3.0

When attempting to identify and debug occasional or intermittent anomalies in signals, the waveform capture rate is a crucial indicator. This rate represents the oscilloscope's ability to capture waveforms per unit of time, reflecting its speed in processing and analyzing signals. MSO3000HD series uses an advanced software and hardware architecture to achieve 5 to 10 times higher data processing performance than previous generation products. Equipped with Ultra Phosphor 3.0, it supports 8-channel parallel graph mapping, with a processing rate of up to 20 Gbps and the waveform capture rate of up to 500,000 wfms/s, and up to 1.5 million 750 ps fast edge signals in sequence mode, facilitating easy and accurate capture of occasional signals.



Brand New Quick Autoset Strategy

Fuzzy control is an intelligent control method based on fuzzy set theory, fuzzy linguistic variables, and fuzzy logic reasoning. The advantages of this type of algorithm are fewer iterations, faster speed, and better anti-interference ability.

In the past, oscilloscopes performed Autoset to find the appropriate signal amplitude and frequency for display. However, the response speed varied significantly among oscilloscope manufacturers due to different solutions adopted. This inconsistency affected the user experience.

UNI-T has redefined Autoset execution by adopting a fast fuzzy algorithm based on analog signals and multi-channel parallel processing technology. This is complemented by a 7-bit high-precision hardware frequency counter, allowing the oscilloscope to quickly find and process the amplitude and frequency of unknown signals during Autoset execution. The entire channel can be opened in less than 1.5s, and a single channel in less than 1s, greatly enhancing working efficiency and reducing the risk of misuse for users who frequently change test objects and require rapid testing.

Multiple Parameter Measurements

Parameter measurement is a crucial function for engineers when using an oscilloscope. MSO3000HD series provides 54 measurement parameters, with the capability to display up to 27 measurement parameters simultaneously. Each page of measurement statistics displays 9 parameters, which can be presented in histograms and trend charts. The histogram visually

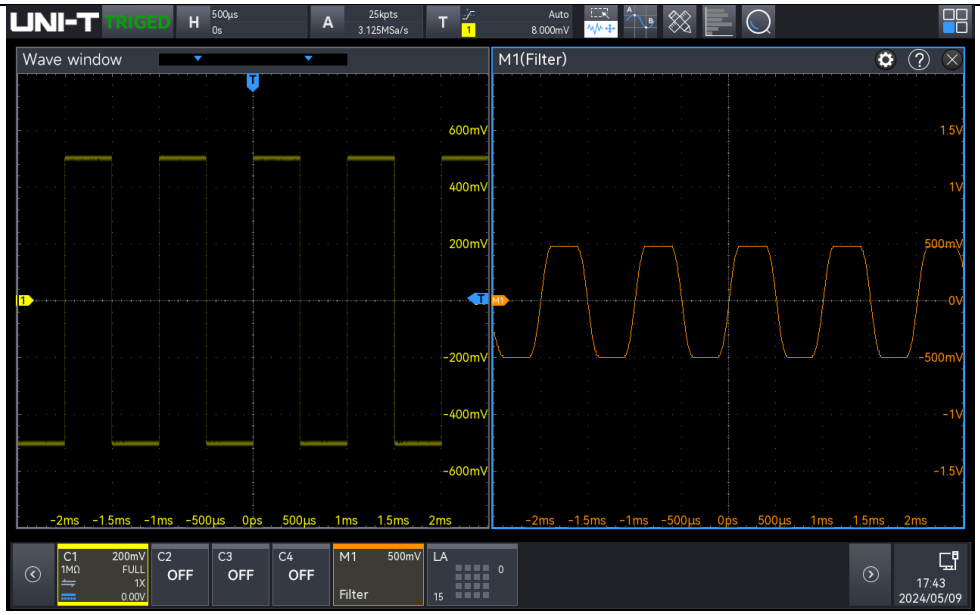
represents the probability distribution of the parameters, while the trend chart reflects parameter changes over time.

The parameter snapshot displays 39 test items for single-channel measurement. These include voltage and time measurement parameters, with measured results constantly refreshed during the process. MSO3000HD series introduces a new amplitude calculation strategy, incorporating top and bottom strategies, making it convenient for engineers to utilize the parameter measurement function. Additionally, MSO3000HD series now includes a burst function that displays burst parameters, enabling accurate and immediate analysis of channel measurement data.

Mathematical Operation

MSO3000HD series provides a system of algorithms for complex waveform operations, allowing you to further process waveforms and display the results directly on the oscilloscope.

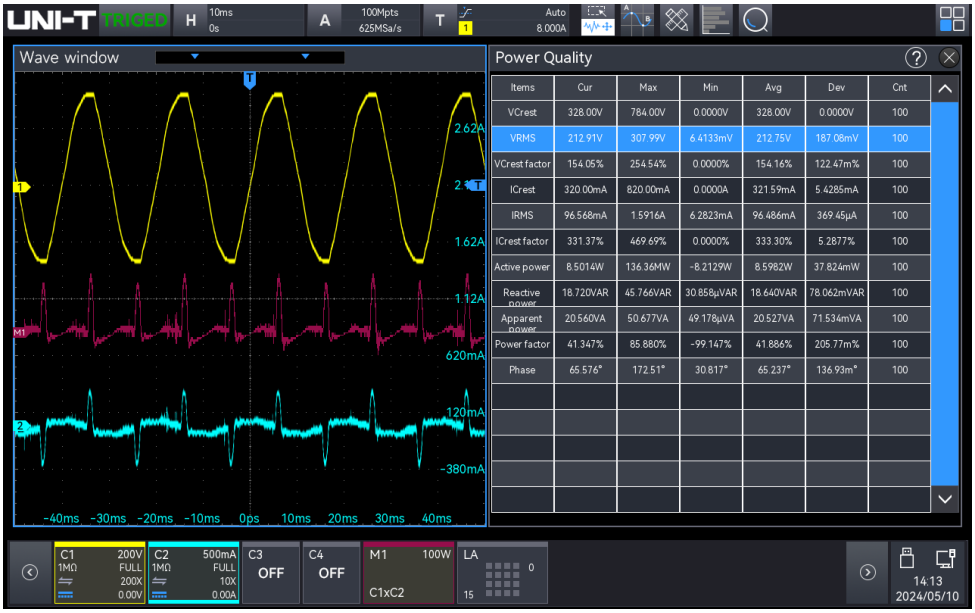
- Basic operation: +, -, *, ÷
- Digital filter (high-pass, low-pass, band-pass and band-limit)
- Custom function operation: analog channel, reference waveform



Navigate and Search

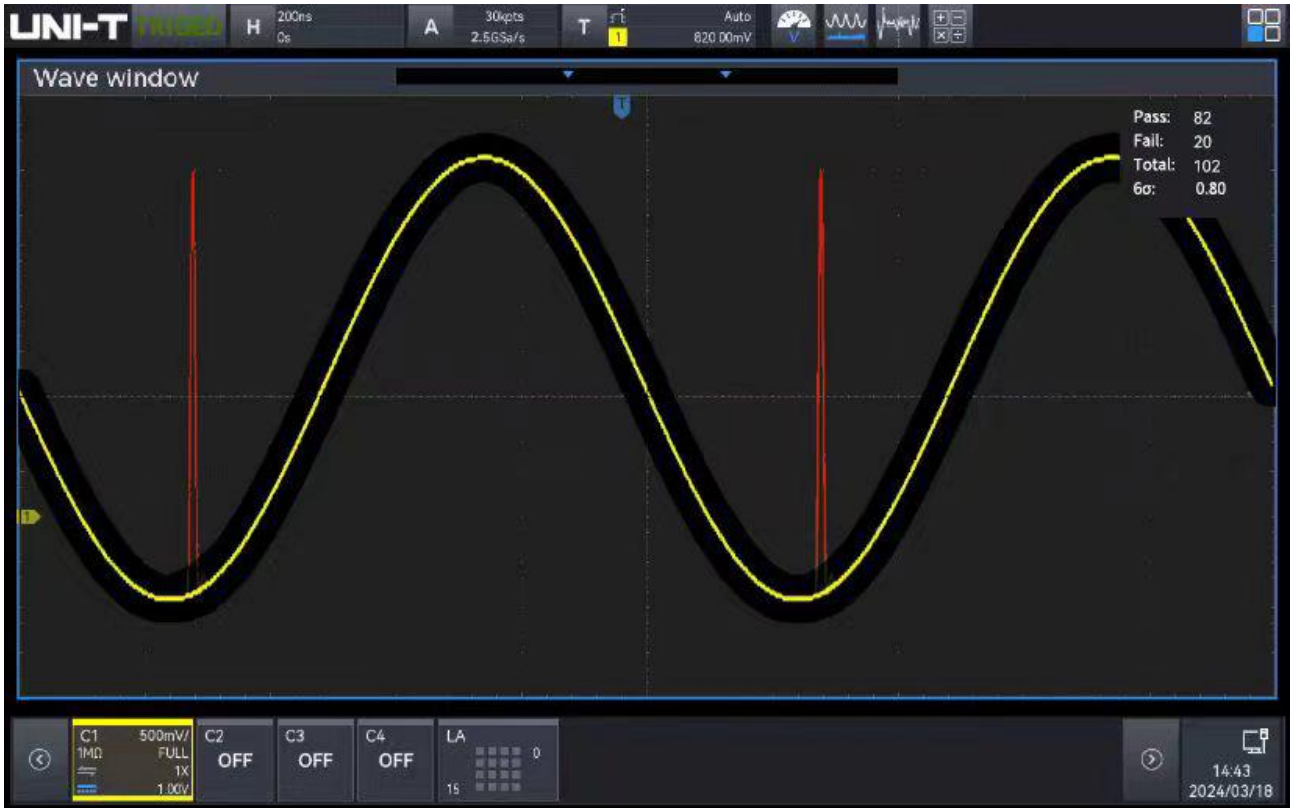
The storage depth of MSO3000HD series is upgraded to 500 Mpts, allowing it to capture tens of thousands of waveforms in one capture. Searching for waveforms manually can be time-consuming for engineers.

MSO3000HD series provides customizable search conditions, which are very useful for locating sampled signals and finding waveforms of interest. With the analysis function, events can be analyzed in detail, eliminating the time-consuming and inconvenient process of manual searches.



Hardware-accelerated Template Test

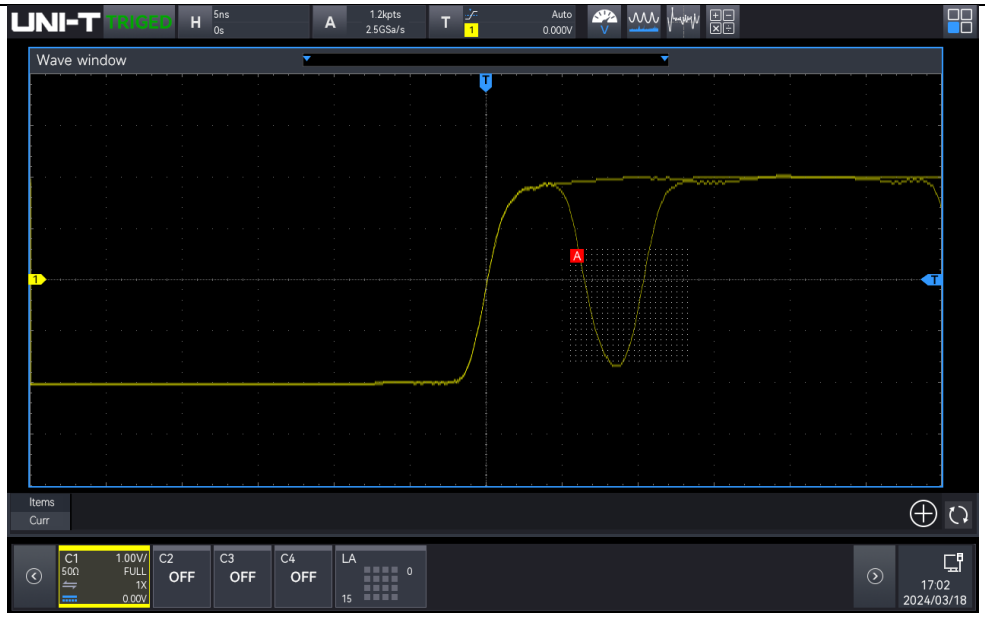
Using hardware-accelerated template testing, the waveform test can be completed in a few seconds to meet special standards.



Zone Trigger

The zone trigger function serves two purposes: firstly, to isolate occasional abnormal signals, and secondly, to stabilize the waveform display. Only a stable trigger can provide a stable waveform display. With this function, engineers can handle complex and variable signals during debugging. The zone trigger function is easy to use, so you don't have to spend time learning how to use it.

A rectangle drawing gesture can quickly isolate a signal to be observed. The waveform does not have to be completely stable to trigger; the zone trigger function can capture a waveform that meets the specified conditions and stabilize it for triggering.



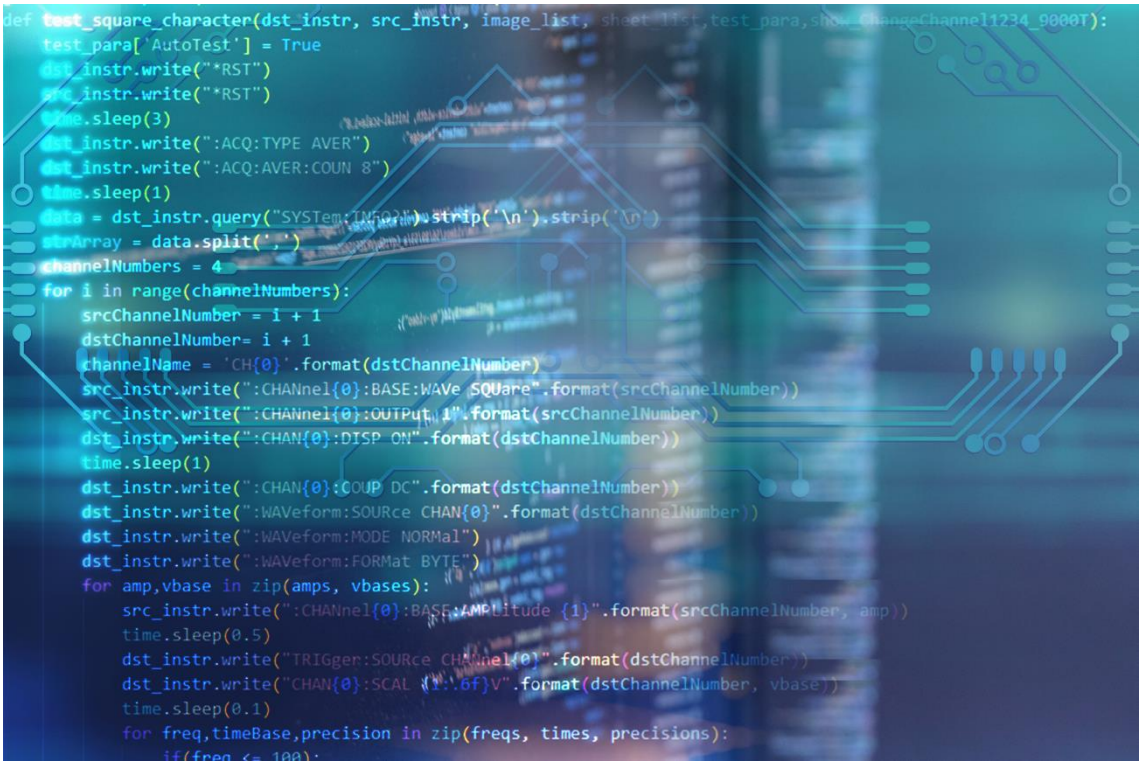
Various Connection

MSO3000HD series offers a wide range of connections for flexibility and convenience.

Wi-Fi connection eliminates the need for cable connections. This makes instrument connectivity simple, with wider coverage and an easy setup.

Multiple Control Methods

Control or secondary development through the instruction set conforming to the SCPI standard.



Use UNI-T free instrument manager for control.

It can be controlled by installing instrument management software on the PC side through LAN, WIFI or USB Device.

WebServer

SCPI for remote checking and control

Export waveform files

Browsing the user manual online

PC/Mobile phone access

Performance Characteristics

All specifications are guaranteed, except those marked "typical".

Unless otherwise stated, all the performance characteristics are suitable for the probe that the attenuation switch set to 10x and MSO3000HD series mixed signal oscilloscope.

To meet these specifications, the oscilloscope should first meet the following conditions.

- The instrument must be operated continuously for at least thirty minutes at the specified operating temperature.
- The self-calibration must be performed when the operating temperature reaches or exceeds 5 °C.

Model	MSO3054HD	MSO3034HD	MSO3024HD
Analog bandwidth	500MHz	350MHz	200MHz
Calculated rise time (10 to 90%) (typical)	≤0.80ns	≤1.00ns	≤1.80ns
Input/output channel number	4 analog channels		
	16 digital channels		
	2-channel signal output		
Sampling mode	Real-time sampling		
Acquisition mode	Normal, peak detect, high resolution, averaging, sequential sampling		
ERES	Enhanced bit: 1, 1.5, 2, 2.5, 3, 4 (8 to 12-bit)		
Maximum sample rate	Analog channel: 2.5 GSa/s (interweave mode), 1.25 GSa/s (non-interweave mode) Digital channel: 1.25 GSa/s		
Average	After all channels have reached N samples simultaneously, the number of N times can be selected from 2, 4, 8, 16, 32, 64, 128, 256, 512, 1024, 2048, 4096, 8192.		
Memory depth	Auto (limit to 10 Mpts), 25 kpts, 250 kpts, 500 kpts, 5 Mpts, 50 Mpts, 100 Mpts, Max		
Maximum waveform capture rate	500,000 wfms/s		
	1,500,000 wfms/s (sequence mode)		
Hardware real-time	125,000 frames		

waveform recording and playing	
Screen	10.1 - inch 1280x800 HD capacitive touch screen
Vertical System (Analog channel)	
Input coupling	DC, AC, GND
Input impedance	(1 MΩ±2%) || (18 pF±3 pF) 50 Ω± 1.5%
Probe attenuation factor	Voltage probe ratio: 0.001X, 0.01X, 0.1X, 1X, 10X, 100X, 1000X, Custom Current probe ratio: 5 mV/A, 10 mV/A, 50 mV/A, 100 mV/A, 200 mV/A, 500 mV/A, 1V/A, Custom
Maximum input voltage	1 MΩ: 400 V (DC+ACVpk) 135 V_{RMS} 50 Ω: 5 V_{RMS} Max
Vertical resolution	12-bit (ERES is enabled with a maximum of 16-bit)
Vertical scale	500 μV/div to 10 V/div (1 MΩ) 500 μV/div to 1 V/div (50 Ω)
Offset range	500 μV/div to 50 mV/div: ±2 V (50 Ω and 1 MΩ) 100 mV/div to 1 V/div: ±5 V (50 Ω) 100 mV/div to 1 V/div: ±25 V (1 MΩ) 2 V/div to 10 V/div: ±250 V (1 MΩ) Vertical offset reading: V
Band limit (typical)	50 Ω: 20 MHz, Full, Custom 1 MΩ: 20 MHz, Full, Custom
Low-frequency response	(AC coupling, -3 dB); ≤5 Hz (on BNC)
DC gain accuracy	<5 mV: ±3% full scale, ≥5 mV: ±2% full scale
DC offset accuracy	± (2%+0.1 div+2 mV)
Unit	W, A, V and U, default: V
Channel-to-channel isolation(typical)	DC to maximum bandwidth: >40 dB
Digital channel	
Threshold	8-channel in one group
Threshold selection	TTL (1.4 V) 5.0 V CMOS (+2.5 V), 3.3 V CMOS (+1.65 V)

	2.5 V CMOS (+1.25 V), 1.8 V CMOS (+0.9 V) ECL (-1.3 V) PECL (+3.7 V) LVDS (+1.2 V) 0 V Custom
Threshold range	±20.0 V, 20 mV stepping
Threshold accuracy	±(100 mV + threshold setting of 3%)
Dynamic range	±10 V + threshold
Input impedance	(101 kΩ±1%) || (9 pF ± 1 pF)
Minimum voltage swing	500 mVpp
Minimum detectable pulse width(typical)	800 ps
Vertical resolution	1 bit
Channel-to-channel deskew range	±100 ns
Horizontal System (Analog channel)	
Time base range	200 MHz (2 ns/div to 1 ks/div) 350 MHz (1 ns/div to 1 ks/div) 500 MHz (500 ps/div to 1 ks/div) (simultaneously display the current sampling rate and memory depth)
Time base accuracy	±1 ppm (original accuracy); ±1ppm (the aging rate of first year); ±3.5ppm (the aging rate of ten years)
Time base delay time range	Pre-trigger (negative delay): ≥ 1 screen width Post-trigger (positive delay): 1 s to 5 ks
Time base mode	Y-T (default)
	X-Y (CH1-CH2, CH1-CH3, CH1-CH4, CH2-CH3, CH2-CH4, CH3-CH4)
	Roll, time base ≥ 50 ms/div, using the horizontal rotary knob to enter or exit Roll mode
	Scan, time base ≥ 50 ms/div, user can select Roll or Scan mode
Trigger	

Trigger level range	Internal: ± 5 div from the center of the screen EXT: ± 9 V
Trigger modes	Auto, Normal, Single
Trigger holdoff range	0.0 ps to 10 s
Trigger coupling (typical)	DC: all signal can pass
	AC: block DC component of input signal
	HF reject: suppress high-frequency components of signals above 40 kHz
	LF reject: suppress low-frequency components of signals below 40 kHz
Noise reject	Suppress the high-frequency noise of signal, to reduce the error-touched possibility
Zone Triggering	
Zone	2 Zones; source: CH1 to CH4; Feature: Must Intersect, Must Not Intersect
Edge	
Slope	Rising, Falling, Either
Source	CH1 to CH4, AC Line, EXT, D0 to D15
Runt	
When	>, <, ≤ ≥, None
Polarity	Positive, Negative
Pulse width	3.2 ns to 10 s
Source	CH1 to CH4, D0 to D15
Window	
Polarity	Rising, Falling, Either
When	Enter, Exit, Time
Set	3.2 ns to 10 s
Source	CH1 to CH4
Nth edge	
Slope	Rising, Falling
Idle time	3.2 ns to 10 s
Edge number	1 to 65535
Source	CH1 to CH4, D0 to D15
Delay	
Edge type	Rising, Falling
When	>, <, ≤ ≥, > <
Delay time	3.2 ns to 10 s
Source	CH1 to CH4, D0 to D15

Timeout	
Slope	Rising, Falling, Either
Timeout	3.2 ns to 10 s
Source	CH1 to CH4, D0 to D15
Duration	
Code pattern	H, L, X
When	>, <, ≤ ≥
Duration	3.2 ns to 10 s
Source	CH1 to CH4, D0 to D15
Setup and Hold	
Clock edge	Rising, Falling
Data type	H, L
Setup	3.2 ns to 10 s
Hold	3.2 ns to 10 s
Source	CH1 to CH4, D0 to D15
Pulse width	
Polarity	Positive, Negative
When	>, <, ≤ ≥
Pulse Width	0.8 ns to 4 s
Source	CH1 to CH4, AC Line, EXT, D0 to D15
Slope	
Slope	Positive, Negative
When	>, <, ≤ ≥
Time	3.2 ns to 1 s
Source	CH1 to CH4
Video	
Standard	PAL, NTSC, SECAM, 525p/60, 625p/50, 720p/24, 720p/25, 720p/30, 720p/50, 720p/60, 1080i/25, 1080i/30, 1080p/24, 1080p/25, 1080p/30, 1080pfs/24
Source	CH1 to CH4
Pattern	
Code pattern	H, L, X, Rising, Falling
Source	CH1 to CH4, D0 to D15
RS232/UART	
When	Start, FrameErr, CheckErrr, Data

Baud rate	2400 bps, 4800 bps, 9600 bps, 19200 bps, 38400 bps, 57600 bps, 115200 bps, custom
Data bit	5 bits, 6 bits, 7 bits, 8 bits
Source	CH1 to CH4, D0 to D15
I2C	
When	Start, Restart, Stop, Loss, Address, Data, Address & Data
Addr mode	7 bits, 10 bits
Addr range	0 to 7F, 0 to 3 FF
Byte length	1 to 5
Source	CH1 to CH4, D0 to D15
SPI	
Mode	Timeout, CS
When	Start, Data
Timeout	100 ns to 1 s
Data bit	4 bits to 32 bits
Source	CH1 to CH4, D0 to D15
CAN (Option)	
Signal type	CAN_H, CAN_L
When	Start, Data Frame, Remote Frame, Error Frame, Over-Load, Identifier, Data, Identifier & Data, End of Frame, Missing Ack, Biterror, CRC, Error, ALL Errors
Data rate	10 kbps, 19.2 kbps, 20 kbps, 33.3 kbps, 38.4 kbps, 50 kbps, 57.6 kbps, 62.5 kbps, 83.3 kbps, 100 kbps, 115.2 kbps, 125 kbps, 230.4 kbps, 250 kbps, 490.8 kbps, 500 kbps, 800 kbps, 921.6 kbps, 1 Mbps, 2 Mbps, 3 Mbps, 4 Mbps, 5 Mbps, custom
Source	CH1 to CH4, D0 to D15
CAN-FD (Option)	
Signal type	CAN_H, CAN_L
When	Start, Data Frame, Remote Frame, Error Frame, Over-Load, Identifier, Data, Identifier & Data, End of Frame, Missing Ack, Bit Error, CRC Error, ALL Errors
Data rate	10 kbps, 19.2 kbps, 20 kbps, 33.3 kbps, 38.4 kbps, 50 kbps, 57.6 kbps, 62.5 kbps, 83.3 kbps, 100 kbps, 115.2 kbps, 125 kbps, 230.4 kbps, 250 kbps, 490.8 kbps, 500 kbps, 800 kbps, 921.6 kbps, 1 Mbps, 2 Mbps, 3 Mbps, 4 Mbps, 5 Mbps, custom
FD data rate	250 kbps, 500 kbps, 800 kbps, 1 Mbps, 1.5 Mbps, 2 Mbps, 4 Mbps, 6 Mbps, 8 Mbps, custom

Source	CH1 to CH4, D0 to D15
LIN (Option)	
Trigger condition	Sync, Identifier, Data, Identifier & Data, Wake Frame, Sleep Frame, Error
Version	v1.x, v2.x, Either
Baud rate	1.2 kbps, 2.4 kbps, 4.8 kbps, 9.6 kbps, 10.417 kbps, 19.2 kbps, 20 kbps, custom
Data length	1 to 8
Source	CH1 to CH4, D0 to D15
FlexRay (Option)	
When	Start, Indicators, Identifier, Cycle, Heade, Data, Identifier & data, End frame, Error
Polarity	BM, BDiff/BP
Baud rate	2.5 Mbps, 5 Mbps, 10 Mbps, custom
Source	CH1 to CH4, D0 to D15
Audio (Option)	
When	Word, Left, Right, Any
Format	Standard, Left Aligned, Right Aligned, TDM
Source	CH1 to CH4, D0 to D15
MIL-STD-1553B (Option)	
When	Sync, Command, Status, Data, Error
Polarity	Positive, Negative
Source	CH1 to CH4
SENT (Option)	
When	Fast: Sync, Status, Data, CRC, STAT+Data, S&D +CRC, F_ CRC Error, CONT Pul Err Slow: Sync, Short ID, Short Data, Short CRC, Short ID & data, Enh ID, Enh Data, Enh CRC, Enh ID & data, SLO CH CRC error
Source	CH1 to CH4, D0 to D15
Manchester (Option)	
When	Start, Header SEG, Data SEG, Tail SEG, Error
Baud rate	500 bps to 10 Mbps
Source	CH1 to CH4, D0 to D15
ARINC 429 (Option)	
When	Start bits, End bits, Label, Source/Destination Identifier, Data, Signal/Status Matrix, Label & bits, Parity error, Bit Error, Gap Error, All Error

Source	CH1 to CH4
Decoding	
Number of decodes	4
Decoding type	Standard: RS232/UART, I2C, SPI
	Option: CAN, CAN-FD, LIN, FlexRay, Audio, MIL-5TD-1553B, SENT, Manchester, ARINC 429
Parallel	Up to 18 bits parallel bus decoding, supports the combination of analog channel and digital channel and supports custom time setting
Source	CH1 to CH4, D0 to D15
Measurement	
Cursor	Voltage difference between cursors (△Y) Time difference between cursors (△X) Reciprocal of △X (Hz) (1/△X)
	Voltage and time of waveform point
	Display the cursor in the automatic measurement
Automatic measurements	**Analog channel: 54 kinds of parameter** Maximum, Minimum, Top, Base, Amplitude, Middle, Peak-Peak, Average, Average-Cycles, RMS, RMS-Cycles, AC RMS, AC RMS-Cycles, Area, Area-Cycles, +Area, -Area, +Area-Cycles, -Area-Cycles, +Overshoot, -Overshoot, +Preshoot, -Preshoot, Period, Frequency, Rise time, Fall time, +Width, -Width, +Duty, -Duty, +Pulse count, -Pulse count, Rising edge count, Falling edge count, Burst width, Burst Interval, Burst Period, Burst Per count, Ratio, Period Ratio, Setup time, Hold time, Setup & Hold Ratio, FRFR, FRFF, FFFR, FFFF, FRLF, FRLR, FFLR, FFLF, Phase(r-r), Phase(f-f) **Digital channel**: Frequency, Period, +Width, -Width, +Duty, -Duty, Rising delay A→B, Falling delay A→B, Phase A→B, Phase B→A
Measurement mode	Common measurement and accuracy measurement (Full memory hardware measurements)
Measurement type	Simultaneously display 27 kinds of parameter measurement
Measurement range	Main time base, Zoom time base, Cursor area
Measurement statistics	Mean, Maximum, Minimum, Std Dev, Count, Tendency chart, Histogram
XY measurement	Time, Cartesian, Polar, Product, Ratio

Analysis	Frequency Counter, DVM, Pass/Fail, Waveform recording, Bode plot, Power Analysis
Math	
Waveform math	A+B, A-B, A×B, A÷B, Advanced, Filter
Filter	Low pass, High pass, Band pass, Band stop
Operation	0,1,2,3,4,5,6,7,8,9 (+, -, *, /, ^, >, <, &&, ||, ==, !=)
Function	sin, cos, sinc, tan, sqrt, exp, lg, ln, floor, abs, acos, asin, atan, sinh, tanh, ceil, cosh, fabs, intg, diff
FFT	
Channel number	4
Window types	Hanning, Hamming, Rectangle, Blackman
FFT count	Up to 4 Mpts
FFT vertical scale	Vrms, dB
FFT	Waterfall: ON, OFF
	Spectrum range: Start frequency, Stop frequency, Center frequency, Span
	Four traces: Normal, Average, Max Hold, Min Hold
	Marker: Marker type, Marker Points, Marker list
Storage	
Setting	Set Status (.set)
Waveform	Waveform data (*.dat) (*.csv)
Image	Image storage (*.bmp) (*.png) (*.jpg)
Report	Decoding Event List (*.csv) (*.pdf) (*.html)
Arbitrary Waveform Generator (Option)	
Channel	2
Sample rate	250 MSa/s
Vertical resolution	16-bit
Maximum frequency	50 MHz
Standard	Sine, Square, Ramp, Noise, DC and Arbitrary wave
Built-in arbitrary	200 types including Sinc, ExpRise, ExpFall, Cardiac, Gauss, Lorentz, and HaverSine
Sine wave	Frequency range: 1 μHz to 50 MHz
	Flatness: ±0.5 dB (relative 1 kHz)
	Harmonic distortion: -40 dBc

	Non-harmonic spurious (typ): -40 dBc
	Total harmonic distortion: 1% (DC to 20 kHz, 1Vpp)
	SNR: 40 dB
Square wave/Pulse wave	Frequency range Square wave: 1 μHz to 15 MHz; Pulse wave: 1 μHz to 15 MHz
	Rising/falling time: <13 ns (typical 1kHz, 1Vpp. 50 Ω)
	Overshoot: typical 2% (1 kHz, 1 Vpp, 50 Ω)
	Duty ratio Square wave: 1% to 99%, adjustable; Pulse wave: 1% to 99%, adjustable
	Resolution of duty ratio: 1% or 10 ns (take the greater value of both)
	Minimum pulse width: 20 ns
	Resolution of pulse width: 10 ns
	Jitter: 2 ns
Ramp wave	Frequency range: 1 μHz to 400 kHz
	Linearity: 1%
	Symmetry: 0.1% to 99.9%
Noise	Bandwidth: 50 MHz (typical)
Arbitrary wave	Frequency range: 1 μHz to 5 MHz
	Waveform length: 8 k
	Internal save position: 200
Frequency	Accuracy: 100 ppm (< 10 kHz); 50 ppm (> 10 kHz)
	Resolution: 1 μHz
Amplitude	Output range: 20 mVpp to 6 Vpp (high resistance); 10 mVpp to 3 Vpp (50 Ω)
	Resolution: 1 mV
	Accuracy: ±5%
DC offset	Range: ±3 V (high resistance); ±1.5 V (50 Ω)
	Resolution: 1 mV
	Accuracy: offset set value ±5%
AM	
Carrier wave	Sine, Square, Ramp, Arbitrary wave
Source	Internal
Modulated wave	Sine, Square, Rising ramp, Falling ramp, Noise, Arbitrary wave
Modulation frequency	2 mHz to 50 kHz

Modulation depth	0% to 120%
FM	
Carrier wave	Sine, Square, Ramp, Arbitrary wave
Source	Internal
Modulated wave	Sine, Square, Rising ramp, Falling ramp, Noise, Arbitrary wave
Modulation frequency	2 mHz to 50 kHz
Deviation	12.5 MHz (maximum)
ASK	
Carrier wave	Sine, Square, Ramp, Arbitrary wave
Modulated wave	Square wave (Duty ratio 50%)
Modulation frequency	2 mHz to 50 kHz

FSK	
Carrier wave	Sine, Square, Ramp, Arbitrary wave
Modulated wave	Square wave (Duty ratio 50%)
Modulation frequency	2 mHz to 50 kHz
Hopping frequency	Any frequency within the range of the Carrier wave signal
Sweep	
Mode	Linear, Logarithmic
Sweep time	1 ms to 500 s
Start and stop frequency	Any frequency within the range of the waveform
Display	
Screen	10.1 - inch multi-touch capacitive screen
Resolution	1280×RGB×800 vertical pixel
Color	24-bit true colors
Persistence	Auto, 50 ms, 100 ms, 200 ms, 500 ms, 1 s, 5 s, 10 s, 20 s, infinite, close
Display type	Point, Vector
Real-Time clock	Time and data (user-defined)
Waveform Intensity	1% to 100% (default 50%)
Grid Intensity	0% to 100% (default 50%)

Backlight Intensity	1% to 100% (default 50%)
Transparent	0% to 100% (default 50%)
Bode plot (Included with AWG option)	
Start frequency	50 Hz to 50 MHz
Stop frequency	60 Hz to 50 MHz
Count	1 to 1000
Amplitude	High resistance: 20 mVpp to 6 Vpp 50Ω: 10 mVpp to 3 Vpp
DVM (typical)	
Source	Analog channel
Mode	DC, AC+DC RMS, AC RMS
Besolution	4-bit
Buzzer	Beeps when the specified limit values are reached or exceeded

Frequency Counter	
Source	any analog channel and digital channel
Measurement	Frequency, Period, Totalizer
Counter	The maximum effective digits are 7, and the refresh time and effective digits are adjustable.
Maximum measurement frequency	Maximum bandwidth of analog channel
Time reference	Internal reference: ±1 ppm (original accuracy); ±1ppm (the aging rate of first year); ±3.5ppm (the aging rate of ten years)
Interface	
USB-Host 3.0	1 on the front panel, 2 on the rear panel
USB-Device 3.0	1 on the rear panel
LAN	LAN (VXI11), 10/100/1000 Base, RJ-45
AUX Out	Trig Out, Pass/Fail, DVM
Gen Out	2 on the front panel
10MHz reference input	50 Ω, amplitude 400 mVpp to 4.5 Vpp (-3.979 dBm, 17.044 dBm), frequency 10 MHz ± 10 ppm
10MHz reference output	50 Ω, 1.65 Vpp square wave
HDMI[1]	1 port for external display or projector

WIFI	802.11b/g/n, WPA-PSK		
General technical specification			
Probe compensator output			
Output voltage	3 Vp-p		
Frequency	10 Hz ,100 Hz, 1 kHz (default), 10 kHz		
Power Source			
Power source voltage	100 V to 240 VAC (fluctuate: ±10%), 50 Hz/60 Hz 100 V to 120 VAC (fluctuate: ±10%), 400 Hz		
Power consumption	120 W Max		
Fuse	3 A, F-class, 250 V		
Environmental			
Temperature	Operating: 0℃ to +40℃		
	Non-operating: -20℃ to +70℃		
Cooling	Forced cooling by fan		
Humidity	Operating: below +35 ℃, relative humidity ≤90%; non-operating: +35 ℃ to +40 ℃, relative humidity ≤60%		
Altitude	Operating: below 3,000 meters; non-operating: below 15,000 meters		
Pollution degree	2		
Operating environment	In-door		
Mechanical Specifications			
Dimension (W×H×D)	364 mm×209 mm×106 mm		
Weight	3.83 kg		
Calibration interval			
Calibration interval	1 year		
Safety Regulations			
Electromagnetic compatibility	Compliance with EMC directive (2014/30/EU), compliance with or superior to IEC 61326-1:2021/ EN61326-1:2021, IEC 61326-2-1:2021/ EN61326-2-1:2021		
	Conducted disturbance	CISPR 11/EN 55011	CLASS B group 1, 150 kHz-30 MHz
	Radiation disturbance	CISPR 11/EN 55011	CLASS B group 1, 30 MHz-1 GHz

	(ESD)	IEC 61000-4-2/EN 61000-4-2	4.0 kV (contact), 8.0 kV (air)
	Radio sensitivity	IEC 61000-4-3/EN 61000-4-3	0V/m (80 MHz to 1 GHz) 3V/m (1.4 GHz to 2 GHz) 1V/m (2.0 GHz to 2.7GHz)
	Electrical fast transient (EFT)	IEC 61000-4-4/EN 61000-4-4	2kV (AC input)
	Surge	IEC 61000-4-5/EN 61000-4-5	1kV (live to zero) 2kV (live/zero to ground)
	Radio continuous sensitivity	IEC 61000-4-6/EN 61000-4-6	3V, 0.15-80 MHz
	Voltage dip and short-term interruption	IEC 61000-4-11/EN 61000-4-11	Voltage dip: 0% UT during 1 cycle 40% UT during 10/12 cycles 70% UT during 25/30 cycles Short-term interruption: 0% UT during 250/300 cycles
Safety specification	EN 61010-1:2010+A1:2019 EN IEC61010-2-030:2021+A11:2021 BS EN61010-1:2010+A1:2019 BS EN IEC61010-2-030:2021+A11:2021		

Remarks
1: only support standard HDMI, not support other adapters.

Order information

	Description	Order No.
Model	MSO3054HD (500 MHz, 2.5 GSa/s, 4 analog channels)	MSO3054HD
	MSO3034HD (350 MHz, 2.5 GSa/s, 4 analog channels)	MSO3034HD
	MSO3024HD (200 MHz, 2.5 GSa/s, 4 analog channels)	MSO3024HD
Standard accessories	National standard cable x 1	
	USB3.0 cable x 1	UT-D30

	BNC-BNC direct-through line x 1	UT-L45
	BNC-red and black alligator connecting wire x 1	UT-L02A
	Passive probe (500 MHz/350 MHz/200 MHz) x 4	UT-P07A/UT-P08A/UT-P05
Optional accessories	200MHz Upgrade to 500MHz Bandwidth	MSO3000HD-BW2MT5M
	200MHz Upgrade to 350MHz Bandwidth	MSO3000HD-BW2MT3M5
	350MHz Upgrade to 500MHz Bandwidth	MSO3000HD-BW3M5T5M
	All serial bus triggering and decoding options	MSO3000HD-BND
	Automobile serial bus triggering and decoding option (CAN, CAN-FD, LIN, FlexRay, SENT)	MSO3000HD-AUTO
	Automotive serial bus triggering and decoding option CAN	MSO3000HD-CAN
	Automotive serial bus triggering and decoding option CAN-FD	MSO3000HD-CAN-FD
	Automotive serial bus triggering and decoding option LIN	MSO3000HD-LIN
	Automotive Serial Bus Trigger and decoding Option FlexRay	MSO3000HD-FLEX
	Automotive sensor serial bus triggering and decoding option SENT	MSO3000HD-SENT
	Audio serial bus triggering and decoding option Audio	MSO3000HD-AUDIO
	Aerospace serial bus triggering and decoding Option MIL-STD-1553	MSO3000HD-MIL1553
	Aerospace serial bus triggering and decoding Option ARINC429	MSO3000HD-ARINC429
	Wireless communication serial bus triggering and decoding option MANCHESTER	MSO3000HD-MANCH
	Dual channel function/arbitrary waveform generator	MSO3000HD-AWG
	Power analysis	MSO3000HD-PWR
	Isolation transformer	UT-ISOT
	High voltage probe	UT-V23/UT-P21/UT-P20
	High voltage differential probe	UT-P30/UT-P31/UT-P32/ UT-P33/UT-P35/UT-P36
	Active probe (single end)	UT-PA2000

	Current probe	UT-P40/UT-P41/UT-P42/ UT-P43/UT-P44/UT-P4030D/UT-P4150/UT-P4500/P4100A/P4100B
	16-channel logic analyzer probe	UT-M15

Remarks: Please order all instruments, accessories and options from your local UNI-T distributor.

Oscilloscope probes and accessories

Passive probes

Model	Type	
UT-P01 	High resistance probe	1X: DC to 8 MHz 10X: DC to 25 MHz Oscilloscope compatibility: all series of UNI-T
UT-P03 	High resistance probe	1X: DC to 8 MHz 10X: DC to 60 MHz Oscilloscope compatibility: all series of UNI-T
UT-P04 	High resistance probe	1X: DC to 8 MHz 10X: DC to 100 MHz Oscilloscope compatibility: all series of UNI-T
UT-P05 	High resistance probe	1X: DC to 8 MHz 10X: DC to 200 MHz Oscilloscope compatibility: all series of UNI-T
UT-P06 	High resistance probe	1X: DC to 8 MHz 10X: DC to 300 MHz Oscilloscope compatibility: all series of UNI-T
UT-P07A 	High resistance probe	10X: DC to 500 MHz Input resistance: 10 MΩ Maximum of operating voltage: <600V pk Oscilloscope compatibility: all series of UNI-T

UT-P08A 	High resistance probe	10X: DC to 350 MHz Input resistance: 10 MΩ Maximum of operating voltage: <600V pk Oscilloscope compatibility: all series of UNI-T
UT-P20 	High resistance probe	DC to 100 MHz Probe coefficient 100:1 Maximum of operating voltage: 1500 Vrms Oscilloscope compatibility: all series of UNI-T
UT-V23 	High voltage probe	DC to 100 MHz Probe coefficient 100:1 Input resistance: 100 MΩ±2% Maximum of operating voltage: 2000 Vpp Oscilloscope compatibility: all series of UNI-T
UT-P21 	High voltage probe	DC to 50 MHz Probe coefficient 1000:1 Maximum of operating voltage: DC 15 kVrms, AC 10 kV (sine wave) Oscilloscope compatibility: all series of UNI-T

Current probes

Model	Type	
UT-P40 	Current probe	DC to 100 kHz Range: 50 mV/A, 5 mV/A Current range: 0.4 A to 60 A Maximum of operating voltage: 600 Vrms Oscilloscope compatibility: all series of UNI-T

UT-P41 	Current probe	DC to 100 kHz Range: 100 mV/A, 10 mV/A Current range: 0.4 A to 100 A Maximum of operating voltage: 600 Vrms Oscilloscope compatibility: all series of UNI-T
UT-P42 	Current probe	DC to 150 kHz Range: 100 mV/A, 10 mV/A Current range: 0.4 A to 200 A Maximum of operating voltage: 600 Vrms Oscilloscope compatibility: all series of UNI-T
UT-P43 	Current probe	DC to 25 MHz Range: 100 mV/A Maximum test current: 20 A Rising time: 14 ns Oscilloscope compatibility: all series of UNI-T
UT-P44 	Current probe	DC to 50 MHz Range: 50 mV/A Maximum test current: 40 A Rising time: 7 ns Oscilloscope compatibility: all series of UNI-T
UT-P4030D 	High-frequency current probe	Bandwidth: DC to 100 MHz Rising time: ≤3.5 ns Range selection: 30 A/5 A Maximum test current: 30 A Voltage of insulated line: 300 V CAT I Oscilloscope compatibility: all series of UNI-T
UT-P4150 	High-frequency current probe	Bandwidth: DC to 12 MHz Rising time: ≤29 ns Range selection: 150 A/30 A Maximum test current: 150 A Voltage of insulated line: 600 V CATII 300 V CATIII

		Oscilloscope compatibility: all series of UNI-T
UT-P4500 	High-frequency current probe	Bandwidth: DC to 5 MHz Rising time: ≤70 ns Range selection: 500 A/75 A Maximum test current: 500 A Voltage of insulated line: 600V CATII 300 V CATIII Oscilloscope compatibility: all series of UNI-T

UT-P4100A 	Low-frequency current probe	Bandwidth: DC to 600 kHz Rising time: ≤583 ns Maximum test current: 100 A Range selection: 100 A/10 A Range sensitivity: 0.1 V/A, 0.01 V/A Common-mode voltage RMS: CATI 600 V CATII 600 V CATIII 300 V Oscilloscope compatibility: all series of UNI-T
UT-P4100B 	Low-frequency current probe	Bandwidth: DC to 2 MHz Rising time: ≤175 ns Maximum test current: 100 A Range selection: 100 A/10 A Range sensitivity: 0.1 V/A, 0.01 V/A Common-mode voltage RMS: CATI 600 V CATII 600 V CATIII 300 V Oscilloscope compatibility: all series of UNI-T

Active/Differential probes

Model	Type	
UT-PA2000	Active single-ended probe	10X: DC to 2 GHz Input capacitance: ≤1 pF Dynamic range: ±7 V (DC or peak AC) Oscilloscope compatibility: MSO7000X/MSO3000X/MSO3000HD series
UT-P30	High voltage differential probe	DC to 100 MHz Attenuation ratio 100:1,10:1 Input differential-mode voltage: ±800 Vpp Oscilloscope compatibility: all series of UNI-T
UT-P31	High voltage differential probe	DC to 100MHz Attenuation ratio 1000:1,100:1 Input differential-mode voltage: ±1.5 kVpp Oscilloscope compatibility: all series of UNI-T
UT-P32	High voltage differential probe	DC to 50 MHz Attenuation ratio 1000:1,100:1 Input differential-mode voltage: ±3 kVpp Oscilloscope compatibility: all series of UNI-T
UT-P33	High voltage differential probe	DC to 120 MHz Attenuation ratio 100:1,10:1 Input differential-mode voltage: ±14 kVpp Oscilloscope compatibility: all series of UNI-T

UT-P35		DC to 50 MHz Attenuation ratio 500:1,50:1 Rising time: 7 ns Accuracy: 2% Input differential-mode voltage: 1/50:130 (DC+peakAC) 1/500:1300 (DC+peakAC) Input common-mode voltage: 100 Vrms, CATI 600 Vrms, CATII Oscilloscope compatibility: all series of UNI-T
	High voltage differential probe	
UT-P36		DC to 50 MHz Attenuation ratio 2000:1,200:1 Rising time: 3.5 ns Accuracy: 2% Input differential-mode voltage: 1/200:560 (DC+peakAC) 1/2000:5600 (DC+peakAC) Input common-mode voltage: 2800 Vrms, CATI 1400 Vrms, CATII Oscilloscope compatibility: all series of UNI-T
	High voltage differential probe	

Options ordering and installation

1. **Purchase options:** Based on your requirements, please purchase the specified function options from UNI-T Sales Personnel and provide the serial number of the instrument that needs the option installed.
2. **Receive certificate:** You will receive the license certificate based on the address provided in the order.
3. **Register and obtain license:** Visit the UNI-T official website license activation session for registration. Use the license key and instrument serial number provided in the certificate to obtain the option license code and license file.
4. **Install the option:** Download the option license file to the root directory of a USB storage device and connect the USB storage device to the instrument. Once the USB storage device is recognized, the Option Install menu will be activated. Press this menu key to begin installing the option.

Limited Warranty and Liability

Uni-T guarantees that the Instrument product is free from any defect in material and workmanship within three years from the purchase date. This warranty does not apply to damages caused by accident, negligence, misuse, modification, contamination or improper handling. If you need warranty service within the warranty period, please contact your seller directly. Uni-T will not be responsible for any special, indirect, incidental or subsequent damage or loss caused by using this device. For the probes and accessories, the warranty period is one year. Visit instrument.uni-trend.com for full warranty information.

Register your product to confirm your ownership. You will also get product notifications, update alerts, exclusive offers and all the latest information you need to know.

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